

Original Article

Long-Term Oncological Outcomes for Patients Treated with
Oncoplastic Breast-Conserving SurgeryOnkoplastik Meme Cerrahisi Uygulanan Hastalarda
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ABSTRACT

Purpose: Oncoplastic breast surgery is a safe and effective surgical technique that improves aesthetic outcomes and broadens the indication for breast-conserving surgery for larger tumors. The purpose of this study was to assess the long-term oncological results of oncoplastic breast-conserving surgery in breast cancer patients.

Methods: This is a retrospective study of 230 breast cancer patients who underwent volume displacement oncoplastic breast surgery techniques between 2007 and 2014. We did not limit our data due to the tumor stage to analyze all and see if tumor size affects the safety of this technique.

We explored patient and tumor characteristics, surgical treatments, surgery-related complications, and pathological outcomes. Moreover, disease-free survival, overall survival, and local recurrence rates of 10 years follow-up were also estimated.

Results: The median follow-up time was 73 months (range 7–149 months). The 10-year disease free survival (DFS) rate was 74.4%, and 10-year overall survival (OS) was 80.0%. The 10-year local recurrence rate was 1.7%. The early complication rate was 22.6%.

Conclusions: The oncoplastic breast-conserving surgery is a method that can be applied safely without unfavorable effects on local relapse and survival rates, even for large tumors.

Keywords: Breast Cancer, Breast-Conserving Surgery, Oncoplastic Breast Surgery

ÖZET

Amaç: Onkoplastik meme cerrahisi, büyük tümörlerde bile iyi estetik sonuçlarla meme koruyucu cerrahi imkanı sağlayan bir tekniktir. Bu çalışma, onkoplastik meme cerrahisi ile tedavi edilmiş hastalarda uzun dönem onkolojik sonuçların değerlendirilmesini amaçlamaktadır.

Gereç ve Yöntem: Bu çalışmada, 2007-2014 yılları arasında hastanemizde onkoplastik meme cerrahisi teknikleri kullanılarak opere edilmiş 230 meme kanseri hastasına ait veriler retrospektif olarak değerlendirilmiştir. Bu alanda yapılmış benzer çalışmaların çoğunda erken evre meme kanseri hastalarına ait veriler bulunmaktadır. Biz böyle bir kısıtlama yapmadan tüm hastalarımıza ait verileri değerlendirerek, tümör boyutunun bu tekniğin güvenilirliğini etkileyip etkilemediğini araştırdık.

Ayrıca, hasta ve tümör özellikleri, uygulanan cerrahi yöntem, cerrahi komplikasyonlar, patolojik sonuçlar ile lokal nüks ve sağkalım özellikleri incelendi.

Bulgular: Median takip süresi 73 ay (aralık 7–149 ay) idi. 10 yıllık hastaliksız sağkalım oranı %74.4 ve 10 yıllık toplam sağkalım oranı %80.0 olarak bulundu. 10 yıllık lokal nüks oranı %1.7 idi. Erken komplikasyon oranı %22.6 olarak tespit edildi.

Sonuç: Onkoplastik meme cerrahisi, büyük tümörü olan hastalarda bile komplikasyon, lokal nüks ve sağkalım oranlarında olumsuzluğa neden olmadan güvenle uygulanabilir bir yöntemdir.

Anahtar kelimeler: Meme kanseri, Onkoplastik meme cerrahisi, Meme koruyucu cerrahi

Introduction

The main objective during breast-conserving surgery (BCS) is to remove the tumor with negative surgical margins (SM) and maintain local control [1,2]. Rather poor cosmetic results could be observed in patients, particularly when a wide excision is performed. The purpose of BCS is increasingly shifting to cosmetic outcomes and patient satisfaction. Although the use of wide excisions contributes to maintaining local disease control, satisfactory results can be achieved via oncoplastic breast-conserving surgery (OBCS). These approaches allow large tumors in large breasts to be removed with improved cosmetic results [3].

BCS with adjuvant radiotherapy (RT) has been established as oncologically safe [4-7]. One of the most important advantages of OBCS is that postoperative RT planning is more manageable for patients with macromastia; in addition, treatment with low doses can be maintained.

In general, OBCS includes two types of techniques. Volume displacement techniques involve glandular or dermoglandular transposition after resection, whereas volume replacement techniques involve autologous tissue or implants.

In this study, we evaluated data from patients who were surgically treated using volume displacement techniques. The aim of this study is to explore long-term oncological outcomes.

Materials and methods

In this study, data of 230 patients treated using several OBCS techniques at Ankara Oncology Hospital between 2007 and 2014 were retrospectively analyzed. The data were

collected from the hospital database and operation room records.

Patient selection: Patients treated with classical BCS were not included in this study. In addition, patients with systemic metastases or another primary malignancy and patients who had neoadjuvant chemotherapy were excluded. Patients whose records could not be reached were also excluded.

Most of the similar studies had evaluated only patients with early-stage breast tumors. We did not limit our data due to the tumor stage to analyze all and see if tumor size affects the safety of this technique.

We explored patient and tumor characteristics (age, pathological subtypes, receptor status, pathological tumor size, axillary status, and pathological status), performed surgical technique, surgery-related complications, and pathological outcomes. We noted the excised tissue amounts from the operating room records, as all tissue weights were measured with a kitchen scale at the time of the surgery. Moreover, disease-free survival, overall survival, and local recurrence rates of 10 years follow-up were also estimated.

A local recurrence was defined as a tumor recurrence in the same breast with similar morphological characteristics as the primary tumor. Regional recurrence was registered as an event in the ipsilateral lymph nodes, including axillary, infra-clavicular region, intramammary, or internal mammary chain.

Surgical techniques: There are different volume displacement techniques involving glandular or dermoglandular transposition after tumor resection. Glandular tissue reshaping involves covering the parenchymal

defect by undermining the surrounding glandular tissues and suturing adjacent glandular tissues or by transposing glandular tissues surrounding the defect [8].

The method that was applied was determined based on the breast volume and tumor location. Applied techniques in our clinic were inferior and superior pedicle wise-pattern mammoplasty, an upper-outer quadrantectomy-racket excision, batwing, and round block (doughnut mastopexy) techniques [9-10]. Through these methods, the nipple-areolar complex and dermoglandular flap could be safely supplied with blood through a virtual pedicle (superior, medial or inferior), and a significant amount of breast tissue and excessive skin could also be removed.

The inferior pedicle technique (wise-pattern mammoplasty) was primarily preferred for tumors located in the superior quadrants of the breast. The superior pedicle technique was preferred for the tumors located in the lower pole of the breast.

Batwing and round block techniques were preferred for tumors located in the central part of the breast and above the nipple-areola complex (NAC).

An upper-outer quadrantectomy-racket excision technique was preferred for upper-outer quadrant tumors. Radial fusiform racket incisions were planned to include the skin over the tumor bed in the upper-outer quadrant of the breast. These incisions were extended from the areola to the axillary hairy skin. A fusiform excision including subcutaneous tissue and pectoral fascia was performed. This technique allows us to perform a sentinel lymph node biopsy (SLNB) and axillary dissection (AD) using the same incision [11].

Contralateral breast symmetrization operations were performed, based on the patients' decisions, in the same session.

There is no standard definition for surgical margin positivity [1,12-16]. However, the National Comprehensive Cancer Network (NCCN) clinical practice guidelines [17] for breast cancer define the positive margins after BCS as "ink on tumor" for both invasive cancer and DCIS and recommend re-excision for positive margins. In contrast, for patients with pure DCIS, at least a 2 mm resection margin width is associated with a reduced risk of ipsilateral breast tumor recurrence. In our study, surgical margin positivity was evaluated as margins <1 mm for invasive tumors and ≥ 2 mm for DCIS.

Statistical analysis: Patient characteristics were given as numbers and percentages, continuous data as median (minimum-maximum). The Pearson Chi-square test and Fisher's exact test were used to analyze categorical variables, and an independent sample t-test analysis was used to analyze continuous variables. P values <0.05 were considered statistically significant. The Kaplan-Meier method was used to determine the breast cancer recurrence rate and survival. All analyses were performed with SPSS software (version 15.0; SPSS Inc., Chicago, IL).

Ethical consideration: The data were collected retrospectively and approved by the Institutional Review Board of "University of Health Sciences Dr AY Ankara Oncology Health Application and Research Center" (Approval Code: 2021-05/1182). This study was conducted in accordance with the ethical standards stated by the 1964 declaration of Helsinki.

Results

Patient and tumor characteristics:

The median age was 50 years (range 27-82). The median follow-up time was 73 months (range 7-149).

Table 1.—Tumor characteristics

Tumor characteristics	N (%)
Pathological subtypes	
Invasive ductal	166 (72.2%)
Invasive lobular	7 (3.0%)
Mixed	10 (4.3%)
DCIS	25 (10.9%)
Other*	22 (9.6%)
ER	
Positive	179 (77.8%)
Negative	51 (22.2%)
PR	
Positive	162 (70.4%)
Negative	68 (29.6%)
C erb B2†	
Positive	17 (7.4%)
Negative	187 (81.3%)
N/A	26 (11.3%)
Tumor size	
Tis	25 (10.9%)
T1	77 (33.5%)
T2	114 (49.6%)
T3	14 (6.1%)
Axilla	
N0	154 (67.0%)
N1	53 (23.0%)
N2	16 (7.0%)
N3	7 (3.0%)

*tubular, medullary, papillary, mucinous, metaplastic carcinoma, small cell carcinoma, †only invasive tumors, N/A not available

Most of the patients had stage-2a tumors (35.3%). There were 14 (6.1%) patients who had T3 tumors. Besides, 76 patients (33.0%) had lymph node metastases. In total, 166 patients (72.2%) were pathologically diagnosed with invasive ductal carcinoma, and 108 of these patients (65%) had extensive intraductal components. We found 22 patient tumors at grade (G)1, while 117 were G2 and 91 were G3. The final pathological evaluation results are summarized in Table 1.

Symmetrization and pathological outcomes:

A symmetrization mammoplasty procedure was performed on 53 patients (23.0%). Three (5.7%) invasive tumors, 3 (5.7%) ductal carcinoma in-situ (DCIS) and 8 (15.1%) atypical ductal hyperplasia were recorded by pathological evaluation of contralateral breast tissue. All patients who were diagnosed with

occult invasive tumors of the contralateral breast had invasive ductal tumors at the primary tumor side.

Surgical treatment:

We performed the inferior pedicle technique on 87 patients (37.8%), superior pedicle technique on 28 patients (12.2%), racket excision technique on 92 patients (40%), and batwing and round block techniques on 23 patients (10%).

The removed tissue amounts were <100 gr for 17 patients (7.4%), 100-500 gr for 106 patients (46.1%), 501-1000 gr for 81 patients (35.2%) and >1000 gr for 26 patients (11.3%).

A highly significant relationship was noted between the removed tissue and surgical technique applied ($p < 0.001$) (Table 2). The largest amounts of tissue were removed with the inferior pedicle technique.

There is no standard definition for surgical margin positivity [1,10-14]. In our study, surgical margin positivity was evaluated as margins <1 mm for invasive tumors and ≥ 2 mm for DCIS. Although a minimum of 198 patients had negative resection margins (86.1%), the tumor distances to resection margins were closer than supposed to be for 32 patients (13.9%).

Reoperation was performed for 19 patients (8.3%). Specifically, 6 of these patients (18.8%) underwent re-excision, and 13 patients (40.6%) underwent a mastectomy. Nevertheless, as we mentioned before, we identified 32 patients who had positive resection margins. Thirteen patients rejected the re-excision offer and had RT. Two patients who refused re-excision and two others who had completed their treatment procedures had local recurrences (LR). We found a significant relationship between LR and SM positivity ($p = 0.035$).

We found a significant relationship between SM positivity and tumor size ($p = 0.008$). In particular, SM positivity was detected more

Table 2. Relationship between removed tissue amount, surgical technique and surgical margins

Surgical technique	Removed tissue (gr)	n (%)	Negative SM n (%)	Positive SM n (%)
Inferior pedicle	<100 g	1 (1.1%)	1 (1.1%)	0 (0%)
	100-500 g	20 (23.0%)	19 (21.8%)	1 (1.1%)
	500-1000 g	50 (57.5%)	43 (49.4%)	7 (8.0%)
	>1000 g	16 (18.4%)	13 (14.9%)	3 (3.4%)
Superior pedicle	<100 g	0 (0%)	0 (0%)	0 (0%)
	100-500 g	11 (39.3%)	9 (32.1%)	2 (7.1%)
	500-1000 g	14 (50.0%)	12 (42.9%)	2 (7.1%)
	>1000 g	3 (10.7%)	3 (10.7%)	0 (0%)
Intraglandular flap	<100 g	15 (16.3%)	12 (13.0%)	3 (3.3%)
	100-500 g	57 (62.0%)	47 (51.1%)	10 (10.9%)
	500-1000 g	14 (15.2%)	14 (15.2%)	0 (0%)
	>1000 g	6 (6.5%)	5 (5.4%)	1 (1.1%)
Other*	<100 g	1 (4.3%)	1 (4.3%)	0 (0%)
	100-500 g	18 (78.3%)	15 (65.2%)	3 (13.0%)
	500-1000 g	3 (13.0%)	3 (13.0%)	0 (0%)
	>1000 g	1 (4.3%)	1 (4.3%)	0 (0%)

SM: surgical margin

*Batwing and round block techniques

Table 3. The relationship between the need for reoperation and pathological subtype ($p<0.001$)

Pathological subtype	Reoperation		Total
	Yes	No	
DCIS	6 (24.0%)	19 (76.0%)	25 (100%)
Inv ductal	15 (9.0%)	151 (91.0%)	166 (100%)
Inv lobular	3 (42.9%)	4 (57.1%)	7 (100%)
Mixed	5 (50.0%)	5 (50.0%)	10 (100%)
Other	4 (18.2%)	18 (81.8%)	22 (100%)
TOTAL	33 (14.3%)	197 (85.7%)	230 (100%)

Table 4.—Survival rates according to pathological stage

Stage	N (%)	10-year disease-free survival	10-year overall survival
0	25 (10.8%)	95.0%	100%
1	59 (25.4%)	89.6%	77.1%
2a	82 (35.3%)	87.0%	73.8%
2b	38 (16.4%)	73.8%	72.0%
3a	21 (9.1%)	71.4%	41.7%
3c	7 (3.0%)	68.6%	42.9%
TOTAL	230 (100%)		

often among patients who had T2 tumors (n=18). There was also a significant relationship between the pathological subtype and SM positivity ($p=0.003$). Fifteen patients diagnosed with invasive ductal carcinoma had positive SM. No significant relationship was observed with the excised tissue weight and surgical technique in regard to SM positivity. Eleven of 87 patients (12.6%) who underwent

the inferior pedicle technique, 5 of 28 superior pedicle patients (14.3%), 14 of 92 intraglandular flap patients (15.2%), and 3 of 23 patients who had other techniques were SM-positive (Table 2).

No significant relationship could be established between the reoperation need and applied surgical technique, pathological stage or removed tissue weight; however,

reoperation need was significantly related to pathological subtypes ($p < 0.001$). Reoperation was required more frequently for patients with mixed (50%) and invasive lobular carcinoma (42.9%) (Table 3).

SLNB was performed on 203 patients who had clinically negative axilla before surgery. In addition, 60 patients with a metastatic sentinel lymph node and 27 patients who had clinically positive axilla before surgery were also subjected to AD.

Adjuvant therapy:

Although 73% ($n = 168$) of patients were administered adjuvant chemotherapy, 79.6% ($n = 183$) of patients received hormonal therapy. Adjuvant whole breast RT was planned and applied for all patients.

Complications:

Wound complications during the early postoperative period were observed in 52 patients (22.6%). In particular, 13% of patients ($n = 30$) exhibited wound separation, 5.7% of patients ($n = 13$) exhibited infection, and the remaining patients ($n = 9$) experienced rarely observed complications such as areola or skin necrosis.

Survival rates:

Four patients (1.7%) experienced LR at a median follow-up time of 73 months. The median interval between the primary breast cancer diagnosis and LR was 47 months (range, 33–57 months). For one of these patients, the inferior pedicle mammoplasty technique was performed, while the other three underwent superior pedicle mammoplasty. There were no significant differences in the LR rates among oncoplastic techniques ($p = 0.35$).

Two patients had axillary recurrences. One patient developed axillary recurrence seven months after surgery; their SLNB was

negative, and the patient underwent AD. The other patient experienced LR at the 42nd month and axillary recurrence at the 80th month after surgery. She also had AD with BCS.

In contrast, distant metastases were observed in 24 patients (10.4%). There was no significant relationship between distant metastasis with either surgical margin positivity or surgical technique.

We found no significant relationship between pathological stage and LR or OS in our series (Table 4).

The 10-year breast cancer-specific DFS rate was 74.4%, and 10-year OS rate was 80.0%. The 10-year LR rate was 1.7%, and the regional recurrence [RR] rate was 2.2%.

Discussion

The most important thing for breast cancer patients when administering BCS is applying primary oncologic surgical principles. Therefore, maintaining appropriate SM and achieving local control with a wide excision is critical and essential.

There is no universal definition of what constitutes a negative microscopic margin. For example, the NCCN guidelines [17] recommend re-excision for “ink on tumor”, whereas other guidelines suggest that adequate margins for DCIS should be ≥ 2 mm after BCS [1,15-17].

In a meta-analysis, Losken et al. [4] reported positive margins in 12.4% of OBCS and 20.6% for BCS alone. In another meta-analysis, Chen et al. [18] reported that the positive-margin rate showed differences between the BCS-alone and OBCS groups. In contrast, the re-excision rate was significantly lower in the OBCS group, which indicated a better therapeutic effect of OBCS than BCS alone. OBCS techniques allow large tumors in large breasts to be removed with improved cosmetic results [19,20].

In our study, we determined that 33 patients (14.2%) had positive resection margins. Most of the studies evaluated only patients with early-stage breast tumors. We did not limit our results to evaluate all of the OBSC experiences. The number of positive margins in our results may be related to not excluding patients with larger tumors. Furthermore, as we pointed out, 47% of patients (n=108) had invasive ductal carcinoma with an extensive intraductal component, which is a factor associated with close or positive SM leading to re-excision [17,21].

Macromastia has typically been a relative contra-indication to BCS due to difficulties with postoperative RT. However, this issue is no longer a problem for patients because OBSC causes decreases in breast volume. Our study determined that all of the patients had postoperative RT without compromise for macromastia.

Early and late complication rates were 22.6% and 21.8%, respectively. More late complications occurred in patients treated using the inferior pedicle technique. This may be explained by the fact that the largest amounts of tissue were removed with this technique.

Another advantage of OBSC is the capacity to maintain symmetrization in the opposite breast using the same technique. In 11.4% of patients, incidental malignancy was discovered, and high-risk lesions were found in 15.1% of 53 patients. These results remind us that the contralateral breast of a woman with breast cancer is at high risk for a new tumor, and underscores the importance of a routine pathological examination of contralateral breast specimens in breast cancer patients [22].

There are few studies reporting LR rates of OBSC [23-26]. A systematic review [3] that analyzed 88 articles focused on OBSC published between 2000-2011 reported LR in

0% to 7% of the patients. In a meta-analysis [19] comparing OBSC and BCS alone, LR rates were similar in both groups. Similarly, Kelemen et al. [27] found no difference in LRs between OBSC and conventional BCS. In another meta-analysis comparing OBSC and BCS, there was no significant difference in recurrence and reoperation rates [28]. Park et al. [29] evaluated the influence of margin status on LR at BCS. They found patients with close margins and those with negative margins both had an LR rate of 7% at 8 years. Similarly, Niinikoski et al. [30] found no differences in the positive SM or reoperation rates between OBSC and BCS. The LR rate was 1.7% in our series, which is compatible with literature data. Two of the four patients had surgical margin positivity, and as we mentioned before, there was no significant relationship between LR and positive SM.

The DFS rate was 74.4% for a ten-year period, which is acceptable compared with the corresponding rates for BCS as a whole [28, 31]. De Lorenzi et al. [32] reported DFS rates of 69% in the OBSC group and 73.1% in the BCS-alone group at ten years.

Based on our long-term results, OBSC is a method that can be applied safely without increasing complications, local relapse, or survival rates even with large tumors.

The cosmetic concerns of women with breast cancer diagnosis should not be forgotten. We know that improved cosmetic results can be obtained without compromising oncological principles with OBSC.

OBSC is a method that can be applied safely and broadens the indication for BCS towards larger tumors.

We believe that the reliability of this method will be understood more clearly via studies involving longer follow-up periods. In addition, as mentioned before, as a result of the first international consensus conference on

standardization of oncoplastic BCS, there is a need for prospective multicenter studies to optimize patient selection and for standardized criteria to qualify and accredit

OBCS training centers. Therefore, we expect OBCS to become increasingly common over time.

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